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season is over, because of their molesting the later varieties it would seem quite as justifiable to shoot them early enough to save the Campbell's Early grapes also. It seems a pity to be compelled to kill such wonderful singers as Sage Thrashers, birds, which, were it not for their grape eating habits, would undoubtedly be very beneficial, but no better method occurs to me and it is difficult to stand by and not try to save the grapes.

In the few isolated vineyards in this lower Yakima Valley the killing of the Thrashers, which infest them during the grape season would evidently save the grapes and, because the Thrashers do not fly about the valley in flocks, only the few which live in each vineyard would have to be destroyed. This would save the grapes, and would probably not appreciably effect the total number of Thrashers inhabiting the valley.

CERTAIN PHASES OF THE THEORY OF RECOGNITION MARKS.

BY W. L. MCATEE.

THE paper by Dr. John Treadwell Nichols on recognition marks in certain species of birds, published in the preceding number of 'The Auk'¹ was read at the Philadelphia meeting of the American Ornithologists' Union in November, 1911. The theory of recognition marks was then unfavorably commented upon by several speakers, of which the writer was one. He now wishes to put in print a series of questions, which must be satisfactorily answered by those who believe in the great importance of directive markings if they would persuade others to share this belief. A statement of the general theory² of recognition marks will be useful and to

¹ Vol. XXIX, No. 1, Jan., 1912, pp. 44-48.

² It should be noted that this theory covers both "banner marks and "sight clues." H. C. Tracy in 1910 (Univ. of Calif. Publ. in Zoology. Vol. 6. No. 13, Dec. 28, 1910) separated these classes of markings, discrediting the crude interpretation of the former, but claiming utility for the latter.

avoid, misinterpretation we quote a mature expression of the theory by its originator and chief developer, Dr. A. R. Wallace.¹

"If we consider the habits and life-histories of those animals which are more or less gregarious, comprising a large proportion of the herbivora, some carnivora, and a considerable number of all orders of birds, we shall see that a means of ready recognition of its own kind, at distance or during rapid motion, in the dark or twilight or in partial cover, must be of the greatest advantage and often lead to the preservation of life. . . . Some means of easy recognition must be of vital importance to the young and inexperienced of each flock, and it also enables the sexes to recognize their kind and thus avoid the evils of infertile crosses; and I am inclined to believe that its necessity has had a more widespread influence in determining the diversities of animal coloration than any other cause whatever." (p. 217.)

A weighty objection to this hypothesis, as it is indeed to most hypotheses coming under the theory of natural selection, is that the need of a certain color, or form, or other detail of animal anatomy either internal or external, can in no wise be advanced as a cause of the development of something to satisfy this need. In the words of D. O'Phace, Esq.—

"Some flossifers think that a fakkilty's granted
The minute it's proved to be thoroughly wanted."

This point need not be labored, for it is evident that all species have needs that have not been satisfied. On the other hand most species have developed characters that are in no way useful; indeed this is sometimes carried to such a degree that the character becomes a handicap. These things are not called forth by necessity; what reason is there to believe therefore that the particular characters known as "recognition marks" have risen in response to a definite need?

Continuing the quotation from Wallace:

"Among birds, these recognition marks are especially numerous and suggestive. Species which inhabit open districts are usually protectively coloured; but they generally possess some distinctive markings for the purpose of being easily recognized by their kind,

¹ Darwinism, 1896.

both when at rest and during flight. Such are, the white bands or patches on the breast or belly of many birds, but more especially the head and neck markings in the form of white or black caps, collars, eye-marks or frontal patches. . . .

"Recognition marks during flight are very important for all birds which congregate in flocks or which migrate together; and it is essential that, while being as conspicuous as possible, the marks shall not interfere with the general protective tints of the species when at rest. Hence they usually consist of well-contrasted markings on the wings or tail, which are concealed during repose but become fully visible when the bird takes flight. . . .

"Most characteristic of all, however, are the varied markings of the outer tail-feathers, whose purpose is so well shown by their being almost always covered during repose by the two middle feathers, which are themselves quite unmarked and protectively tinted like the rest of the upper surface of the body." (p. 222.)

Proceeding with the questions previously referred to:

Why, if recognition marks are so important as a means of keeping members of a flock together, do so many species of birds possessing this type of coloration, migrate by night as well as by day, or even migrate chiefly by night?

Wallace, asserts that these marks "are very important for all birds which congregate in flocks or which migrate together." Yet practically all of the smaller migrants do most of their traveling at night, when recognition marks can be of little or no service. Even the bulk of the larger species, as Ducks, Geese and other waterfowl, which do much traveling by day, have no difficulty in making extensive migrations at night and in some localities they habitually choose night-time for their lesser journeys.

It is worthy of note that the principal exceptions to the rule of night migration among the smaller birds, viz: Swifts, Nighthawks, and Swallows, have one characteristic — the habit of feeding while in full flight — in common. There is little doubt moreover that this habit is the direct cause of their diurnal migration; that is to say, recognition marks probably have nothing to do with it.

If recognition marks are so valuable as a means of keeping members of a species together, why is it that in the case of certain species, every member of which has the same directive coloring, the young birds and the adults migrate in separate flocks?

It is evident that in such cases (frequent among Shore-birds) that some condition is more important than the possession of the regulation directive marks of the species.

If recognition marks are so important to flocking species, why is it that their usefulness is swamped, as it were, in many cases, by the flocking together of distinct species?

For instance during the only time that Shore-birds, Ducks, Geese, Swallows, Sparrows and Warblers flock, distinct species show no aversion to flocking together; in fact they habitually do this very thing.

Why do directly colored species ignore the hall mark of their kind, and crossmate?

This is done promiscuously and freely by Anatinæ; other examples are *Vermivora* and probably *Colaptes*.

We may well inquire also why certain very closely related species do not have recognition marks? For instance, *Sturnella magna* and *Sturnella neglecta*; and certain species of *Empidonax* and *Vireo*.

Species in which all of the individuals are not colored alike, or do not have certain conspicuous markings in common, cannot be said to have specific recognition marks. This category includes those species the young of which are very different in color from the adults, a condition that persists for two or three years or more in certain cases. With them must be grouped also, the dichromatic Screech Owl, the four species of Buteonidæ, and the three Jaegers that have a normal melanistic phase, and the numerous species which exhibit completely or nearly completely distinct sexual coloration, either at certain seasons or permanently. We may well enquire therefore how such species as these have made a success of the struggle for existence without the aid of the highly esteemed recognition marks?

If recognition marks are of vital importance why are they so variable?

They vary extremely in the Mniotiltidae, as the writer knows from a special study of the subject. White blotches may be present on anywhere from two to five pairs of rectrices in the same species. The white wing spot so characteristic of *Dendroica caerulescens* varies greatly, and is sometimes absent. Both the primary blotch and tail spots may be lacking in the same specimen.

If liable to considerable individual variation, what dependence can be placed in recognition marks as a means of identifying their fellows, by closely similar species, by *Penthestes atricapillus* and *P. carolinensis* for instance, or *Dendroica auduboni* and *D. coronata*, by the Flickers or Dusky Ducks? One of Wallace's illustrations of recognition marks—those of two species of *Scolopax* (*Darwinism*, fig. 22, p. 225)—certainly does not show more difference than do numerous commonly observed individual variations. One of the fallacies into which coloration theories lead is brought out by a comparison of this figure with that on p. 241 (fig. 23) illustrating a case of mimicry. In the latter cut the objects which are supposed to be so similar that one, the mimic, gains protection by the inability of birds to tell the forms apart, are actually much more different than the two sets of directive markings (shown in the former illustration), which are supposed to be so distinct as to enable the species easily to recognize their kind.

The variability of recognition marks brings up another question: what must be their extent in order that they may have directive value? Take for example the white tips on the tail feathers of the robin, which are extremely variable and often absent. In certain warblers we can get a series showing all stages from no tail spots to large blotches on at least two pairs of feathers. Where can the line be drawn?

Recognition marks are claimed to exist in other groups than birds, even in insects, but in certain cases, becoming more numerous in the lower groups, they are termed warning colors. Where is the line drawn that separates these categories, and why?

Is there any evidence that birds use in a directive sense the patches of colors, termed recognition marks?

A valid objection to the theory has been made to the effect that the usefulness or at least the necessity for these marks depends upon the assumption that the animals possessing them are less acute observers than human beings. Humans can readily recognize species by glimpses of outline when no color is seen, or by peculiarities of motion, in the case of flight at least, at such distances that the observation of color is entirely out of the question. There is much good evidence furthermore that the assumption mentioned is unfounded. Anyone who has handled live decoy

ducks and geese, is familiar with the practice of leaving the mates of some of the birds behind to make them call better during the day. He cannot have failed to observe also when coming back to camp in the evening at what a distance these paired birds become aware of each other's presence and give vociferous greetings. Ducks in no matter how large a flock readily pick out their mates. Can creatures possessed of such powers have any vital need for the comparatively coarse distinctions, not of individuals but of their species as a whole, which are termed recognition marks?

The evidence is very confusing from the fact that the powers of observation of these same birds, so keen in the case just described, apparently become so dull in the presence of decoys, that the extermination of species would result, were shooting not closely regulated. Neither the one occurrence nor the other however is evidence of the usefulness of recognition marks. Hence we may well inquire:

Why, if directive markings are so important in guiding birds to flocks of their kind do so many birds among those reputed to have well developed recognition marks, come freely to the crudest forms of decoys?

The writer was initiated into the mysteries of Shore-bird shooting by Mr. J. B. White, a life long hunter on Currituck Sound, N. C. The decoys we used were merely rounded handfuls of water plants (*Potamogeton*, *Naias* and the like) placed on pegs which held them just above the water. Shore-birds of many species decoyed perfectly to these lumps and if not fired at, would linger among them for some time, feeding in a perfectly normal manner.

Wild ducks are tricked too by very primitive decoys. Old battered ones, with no particular colors, or colors that were never seen on fowls of sea or land, with broken bills, or missing heads are familiar sights on many shooting grounds yet they serve the purpose. Iron ducks with no paint, and wooden ducks, of thrice normal size, which have been sculptured with an ax, are used with great effect by the battery shooters of Currituck. The confiding manner in which Ducks will cluster about a lost decoy, or lie among a setting of decoys that is left out but not very frequently shot over, to say the least, shows a disposition on the part of ducks not to insist very strongly on the possession of certain spots or bands of

color in their temporary associates. In some places decoys representing only the rear parts of ducks are used, and these ever-dipping counterfeits which never show a head, nevertheless fill the bill; in other localities the bottom in shallow water is simply turned up in spadefuls, making dark lumps and ducks decoy to these. Mr. White tells me that the best day's shooting at black ducks he ever enjoyed was begun with his shoes as decoys, dead ducks being substituted as they were killed. These things prove that on some occasions at least some of the most typically flocking birds do not pay any attention whatsoever to markings directive or otherwise.

AN APPARENTLY UNRECOGNIZED RACE OF THE RED-SHOULDERED HAWK.

BY LOUIS B. BISHOP, M. D.

Buteo lineatus texanus subsp. nov.

TEXAS RED-SHOULDERED HAWK.

TYPE.—♀ adult, No. 22355, Coll. of Louis B. Bishop; Corpus Christi, Texas, Nov. 7, 1909; John M. Priour.

SUBSPECIFIC CHARACTERS.—Similar to *Buteo lineatus elegans*, but breast usually more spotted with buffy, the dark shaft lines of chest more conspicuous and the head and back more rufous.

MEASUREMENT OF TYPE.—Wing, 12.98; tail, 8.62; culmen, .90; tarsus, 3.23 inches.

Sixteen adult Red-shouldered Hawks, collected for me at Corpus Christi and Brownsville, Texas, in October and November, 1909, by Mr. Frank B. Armstrong and John M. Priour, closely resemble each other and differ as described above from the only adult *B. l. elegans* I have been able to examine. They are also much larger than this bird — an adult spring male from California — but not above the measurements given for this race.

These Texas birds are much more richly colored below than fall